



CASE STUDY SUMMARY

Enhanced automation was used to expand the capability of HP's energy management system to automate lighting as well as HVAC control.

- Participant:
Hewlett-Packard
Company
- Building Type:
Office campus
- Site Size:
1.4 million ft² / 6,100
occupants
- Project Cost:
\$275,000
- Project Incentives:
\$212,000
- Primary Benefit:
Energy cost savings

Enhanced automation has helped Hewlett-Packard achieve \$1.5 million in annual energy savings.

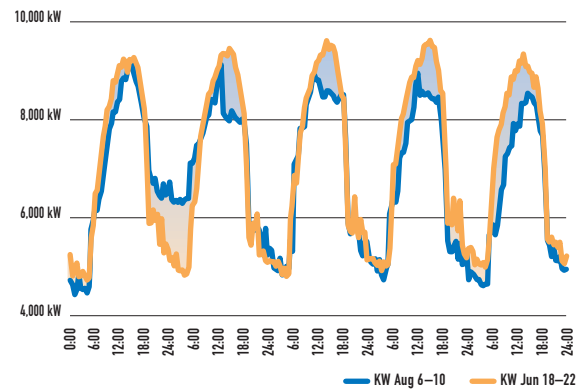
With the onset of California's energy crisis, Hewlett-Packard Company (HP) wanted to be doing more to save energy and to help avert rolling blackouts in their community. HP enhanced its existing energy management system by adding a greater level of automation, which allows them to cut peak load by about 12 percent without jeopardizing occupant comfort or productivity. In fact, enhanced automation has helped HP to maintain 1996 energy levels and save on energy costs, despite growing their business.

- Labor- and time-intensive to shed load
- Inability to curtail energy use and still maintain occupant comfort
- Unpredictable energy supply

PROBLEM

Hewlett-Packard (HP) Company facility operators had been optimizing the campus' energy use for many years. However, with the onset of California's energy crisis, HP wanted to be doing more to save energy and to help avert rolling blackouts in their community. Their energy management system (EMS) had limited automation: cutting back on HVAC and lighting loads was labor- and time- intensive, involving the manual adjustment of several controls spread out over the vast campus. Such a system did not allow them the flexibility to curtail load and still maintain occupant comfort, a high priority at HP.

HP Roseville Electrical Demand



The above graph shows the demand curves for two separate weeks with similar temperature profiles. Demand reduction was implemented on Tuesday, Wednesday, and Thursday of the second week in August (blue line). Comparison of the two demand curves shows that during the demand reduction, the expected peak was reduced by 0.5 MW to 1.0 MW, as seen in the shaded areas.

- More precise control of loads
- Automated control of HVAC and lighting systems

SOLUTION

The availability of funding from the California Energy Commission for the installation of enhanced automation technologies served as a catalyst for HP to move ahead with plans to modify the automation capability of their EMS. HP traditionally used its EMS for monitoring temperatures and for operating air-handlers and other mechanical HVAC equipment. However, control over lighting was limited. Adding the desired level of automation involved linking the EMS to all lighting and HVAC systems via direct digital controls (DDC). Roseville Electric, HP's municipal electricity supplier, secured and administered the California Energy Commission grant funds and played a key role in shaping and implementing the project.

"The project was a resounding success. We discovered very quickly that we could curtail demand any day of the year, and we did. Our historical peak was 10.9 MW and we were routinely able to reduce that to about 9.5 MW, saving us not only energy, but demand charges as well."

"As utilities move toward time-of-use metering, a business' ability to control utility costs by automating energy use according to price will become increasingly valuable."

Steve Eymann,
HP Facilities Engineer



"Before, in times of power shortages, we would curtail by manually shutting off selected circuit breakers. Now, our enhanced energy management system automates this process, saving our staff valuable time and effort."

- Automated load shedding
- Increased occupant comfort
- Targeted HVAC control
- Energy cost savings

BENEFITS

As a result of these changes, HP is now able to shed up to 1.5 MW of peak load, without disrupting occupants' productivity or comfort. Originally intending to operate their new load-shedding strategies under emergency situations only, HP found that they could actually benefit from using them on a day-to-day basis. Due to their conservation efforts over the past eight years, HP Roseville is currently saving \$1.5 million annually.

Enhanced automation allows HP to program a not-to-exceed setpoint for electrical demand and instruct the EMS to initiate pre-programmed load shedding strategies when that setpoint is approached. The system is able to monitor the effects of these strategies on overall demand throughout the day and to make continual adjustments so that the demand is kept just below the setpoint.

Direct control over mechanical HVAC equipment allows HP to operate their systems efficiently. Facility operators can now adjust zone temperatures based on actual, real-time occupancy levels. For instance, if operators know that personnel in one section of a building will be assembled in a conference room for three hours on a summer afternoon, they can operate HVAC equipment so that temperatures are higher in the emptied building section and lower in the crowded conference room.

PROJECT SITE DESCRIPTION

- **Location:**
Roseville, California (16 miles northeast of Sacramento)
- **Size:**
10 buildings occupying 1.4 million ft²
- **Space Function:**
Research and development, design, engineering, manufacturing, testing, customer support and sales
- **Number of Occupants:**
6,000
- **Site Contact:**
Steve Eymann
HP Facilities Engineer

Energy Usage

- **Summer Peak Demand**
10.9 MW
- **Curtailable Demand**
1.5 MW

Equipment Installed

- DDC modules
- CO₂ sensors
- High speed data line and Ethernet communications card

Project Cost

- \$275,000

Project Incentives

- \$212,000



Technical Information

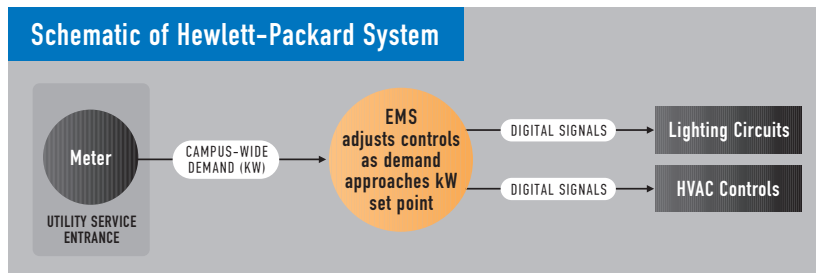
HP's enhanced automation project involved expanding the capabilities of existing systems: A Siemens APOGEE® energy management system, a high-speed local area network, direct digital controls (DDC), and Square-D PowerLogic® power monitors. The modifications included mainly software programming of the EMS, along with some new hardware and wiring. The result is a powerful building automation system that can maintain demand setpoints without disrupting occupancy comfort.

To monitor the real-time effects of load-shedding strategies on overall demand, HP linked its electric utility meters to the APOGEE system via existing Square-D PowerLogic monitors that were attached to the meters. The system now collects and archives 15-minute interval data. This linkage allows facility operators not only to see the immediate effects of load-shedding strategies, but also to program their EMS to reduce campus-wide demand to a specified kW amount. The EMS will now shed loads in a pre-determined sequence until demand reaches the setpoint.

This programming was made possible by the addition of both

automated demand control ventilation and lighting controls. To implement demand control ventilation, CO₂ sensors were installed to ensure that air quality levels remain above standard as outside air volume changes. The EMS was also programmed to send digital signals to gradually close hundreds of variable-air-volume terminal boxes and control valves to reduce the use of chilled water for space cooling. Chillers and pumps in the central chiller plant respond to the reduced demand for chilled water as they would to normal reductions in cooling demand. Variable frequency drives on chilled water circulation pumps slow the pumps to reduce the circulation in the secondary chilled water loop, and the load on the chillers is reduced until the chillers shut down.

HP's lighting system was also enhanced with new controls. HP installed multiplexers to lighting control panels in six campus buildings. The EMS is programmed to shut off pre-determined, non-essential lights whenever load reduction is needed. Following the curtailment, the EMS automatically returns lighting to normal levels.



TAKING THE NEXT STEP

Free resources are available from the California Energy Commission.

- Business Case Guidebook
- Technical Options Guidebook
- Contractor and Vendor Lists
- Technical Assistance
- Case Studies

- 1 Alameda County
HVAC Controls/
Government Facility
- 3 Comerica Building
HVAC and Lighting Controls/
Large Office Building
- 4 Foothill-De Anza
Community Colleges
HVAC and Lighting Controls/
College Campuses
- 5 Staples, Inc.
HVAC and Lighting Controls/
Retail Chain
- 6 Hilton/Doubletree Hotel
HVAC and Lighting Controls/
Hotel and Convention Center

Contact us for free materials or for further information:

- 1-866-732-5591
- enhancedautomation@xenergy.com
- www.energy.ca.gov/enhancedautomation

Additional Resources

- California Energy Commission
www.energy.ca.gov/peakload/index.html
- Cash for Kilowatts Web site
www.energy.ca.gov/peakload/cash_kilowatts.html
(also for 50-200 kW demand)
- Your local utility
 - www.sdge.com/business/drpf.html
 - www.pge.com/003_save_energy/003b_bus/index.shtml
 - www.sce.com/sc3/002_save_energy/002i_load_redn/default.htm